

Standard Measures during Spaceflight

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Experiment Design Overview

6-month mission



Pre-flight	In-flight	Post-flight
Actigraphy w/ sleep logs (2 weeks each) (L-180, L-90)	Actigraphy (2 weeks each) (bimonthly)	Actigraphy w/ sleep logs (2 weeks) (R+0)
Personality Survey (anytime preflight)	Sleep Quality/Team Questionnaire (monthly)	Cellular Profile Survey (R+15)
Cognition (L-120 fam, L-90)	Cognition (FD30 & R-30)	Cognition (R+10, R+30)
Cellular Profile (ambient blood, saliva) (L-180, L-90)	Cellular Profile (ambient blood, saliva) (Early mission vehicle return, R-0)	Cellular Profile (ambient blood, saliva) (R+30)
Biochemical Markers (blood, urine) (L-180)	Biochemical Markers (blood only) (FD30, R-30)	Biochemical Markers (blood, urine) (R+30)
Microbiome (body, saliva, fecal) (L-90)	Microbiome (body, saliva, fecal) (FD30, R-30)	Microbiome (body, saliva, fecal) (R+30)
Carotid Intima-Media Thickness (L-180)	N/A	Carotid Intima-Media Thickness (R+5, R+30)
Sensorimotor Measures (L-180, L-90)	N/A	Sensorimotor Measures (R+0 at landing site, R+0 at JSC, R+9)

Crew time: ~7 hours

Crew time: ~19 hours

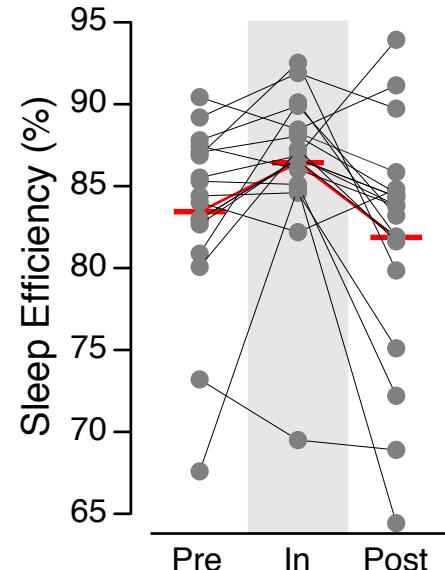
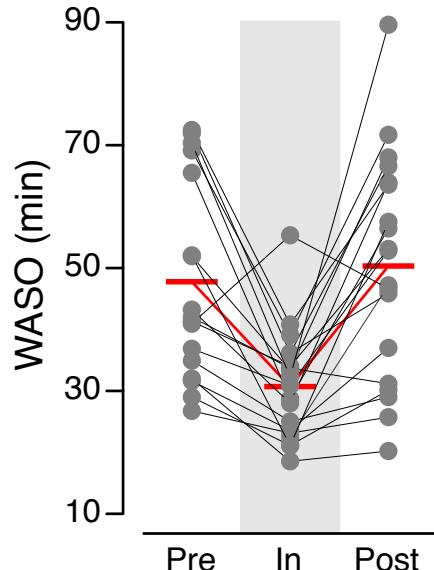
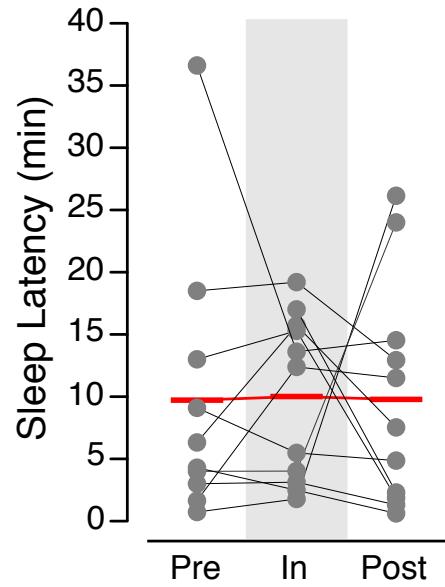
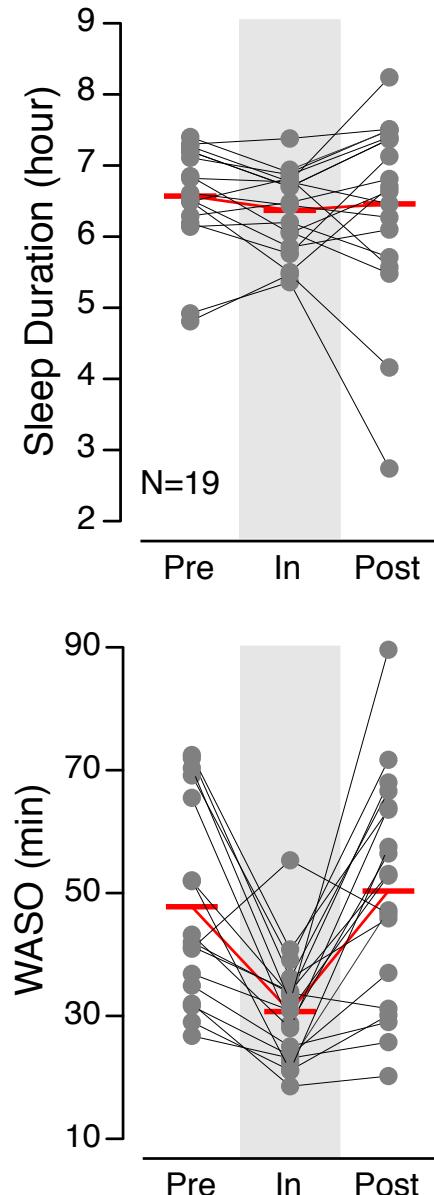
Crew time: ~6 hours



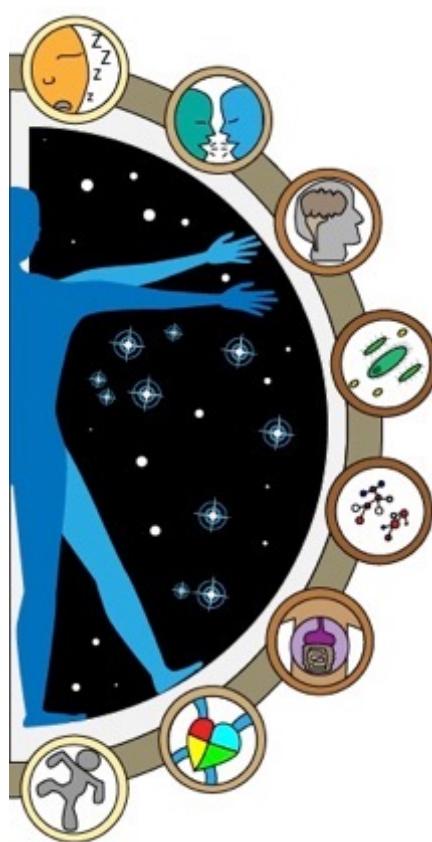
Results – Sleep

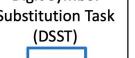


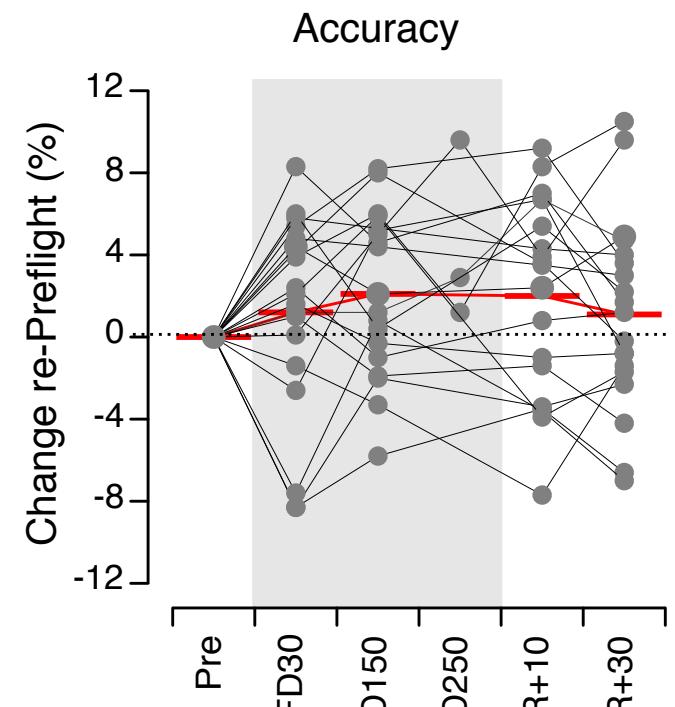
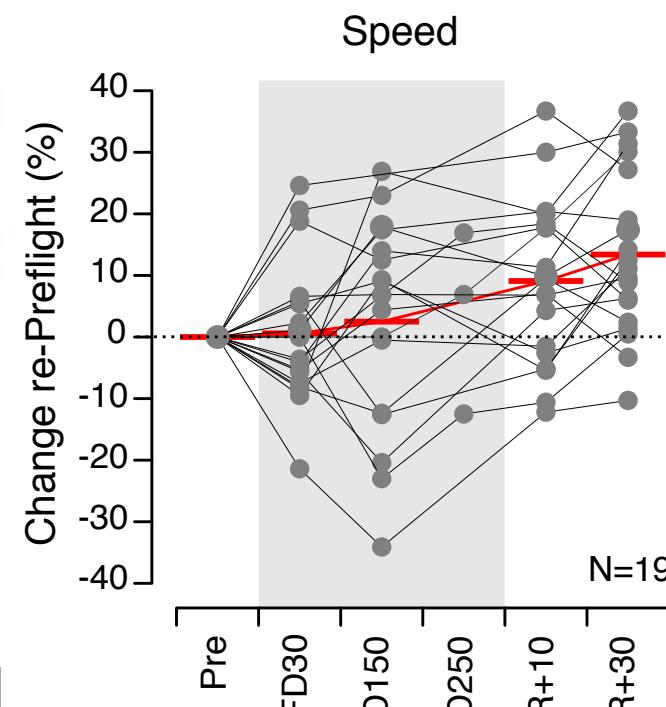
- No changes in sleep duration and latency
- Wakefulness After Sleep Onset (WASO) decreased in-flight
- Sleep efficiency increased in-flight



Results – Cognition

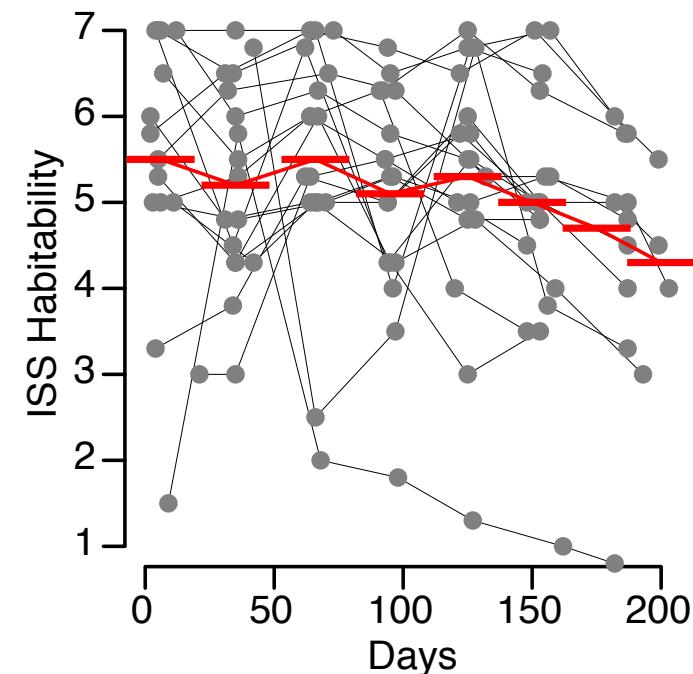
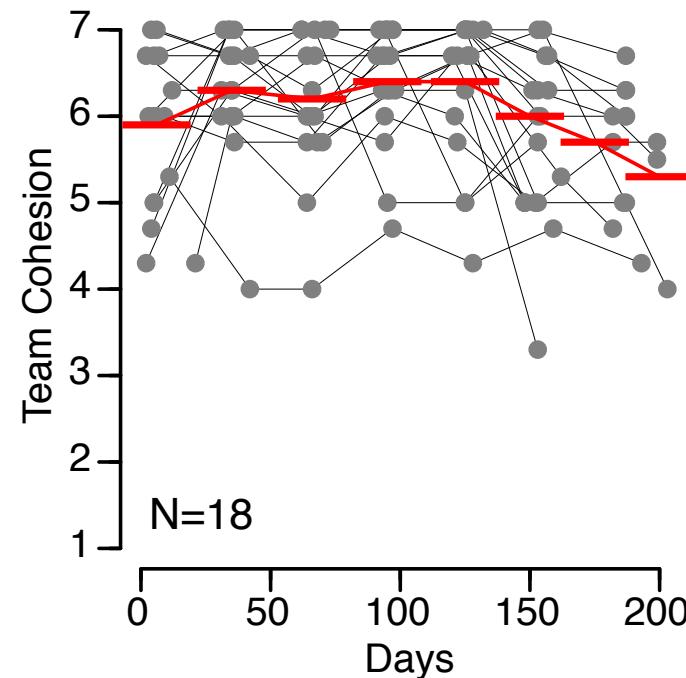
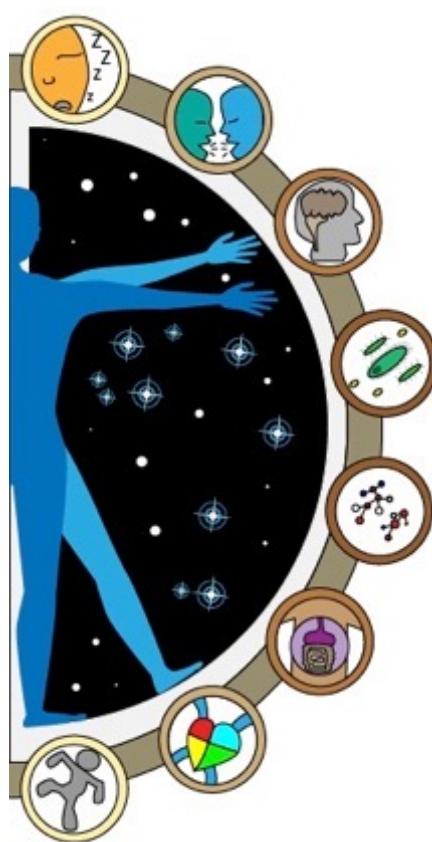


Motor Praxis Test (MP)	Visual Object Learning (VOLT)	Fractal 2-Back (F2B)
		
Abstract Matching (AM)	Line Orientation Test (LOT)	Emotion Recognition Task (ERT)
		
Matrix Reasoning Test (MRT) Digit Symbol Substitution Task (DSST) Balloon Analog Risk Test (BART)		
		
Psychomotor Vigilance Test (PVT)		
		



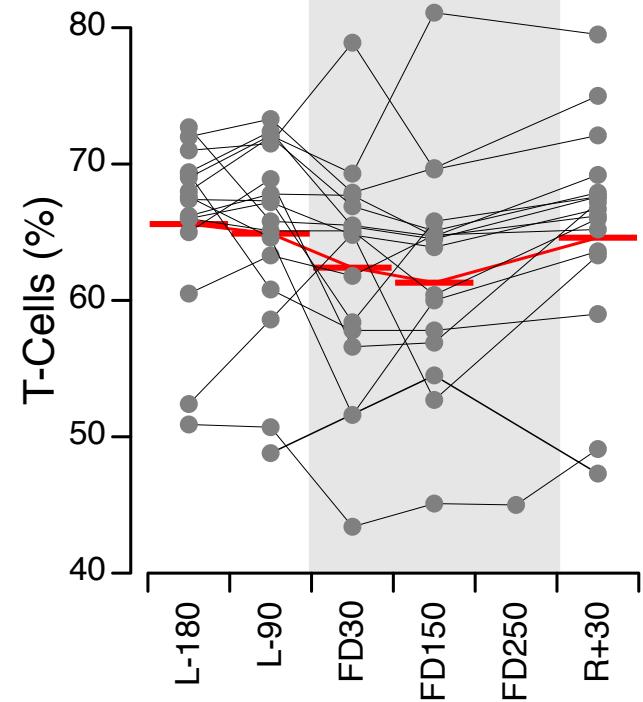
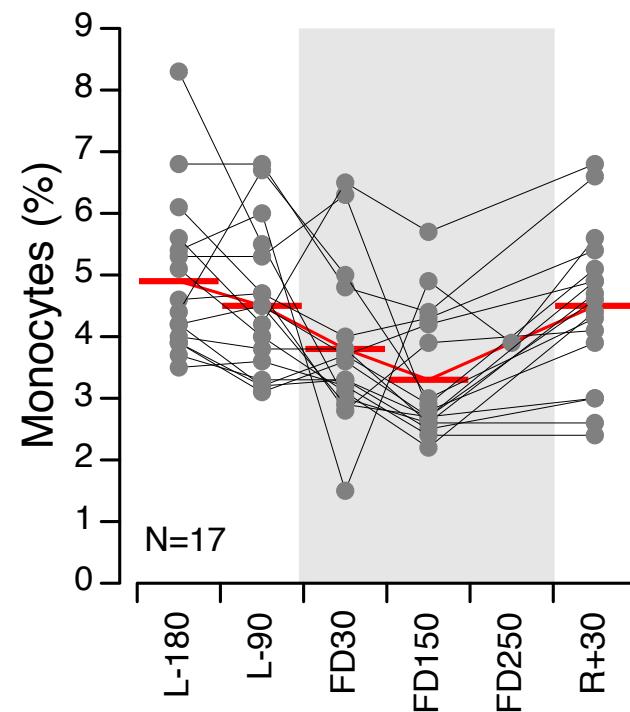
- Execution speed and accuracy increased with the repetition of the tests

Results – Team Performance



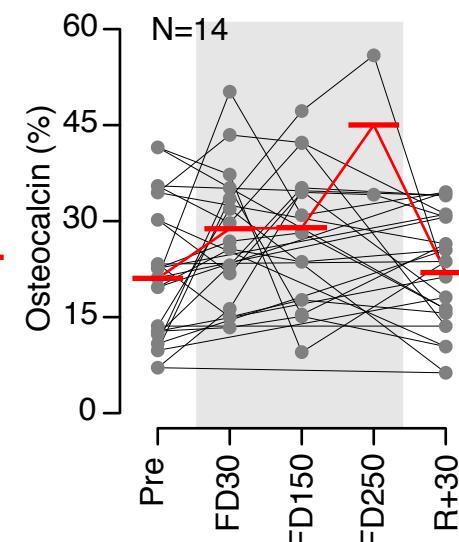
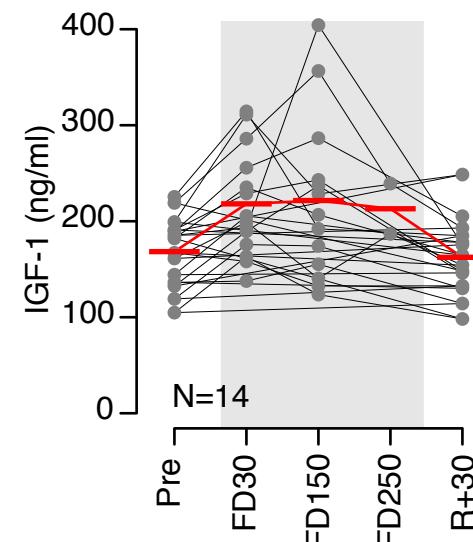
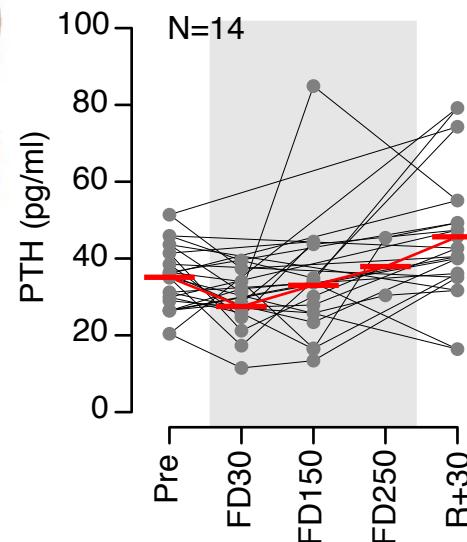
- Team cohesion and ISS habitability decreased from FD150

Results – Cellular Profile



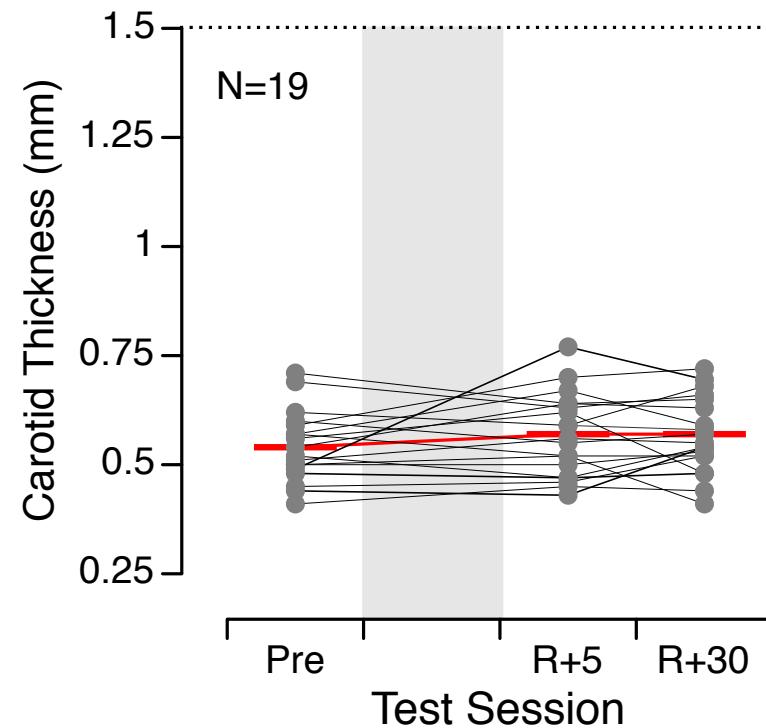
- Monocytes and T-Cells concentration decreased in-flight

Results – Biochemical Markers



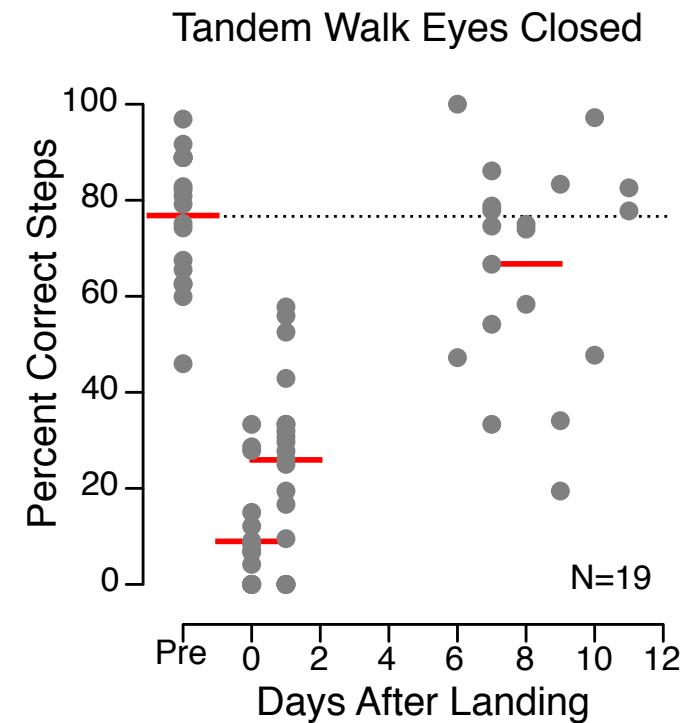
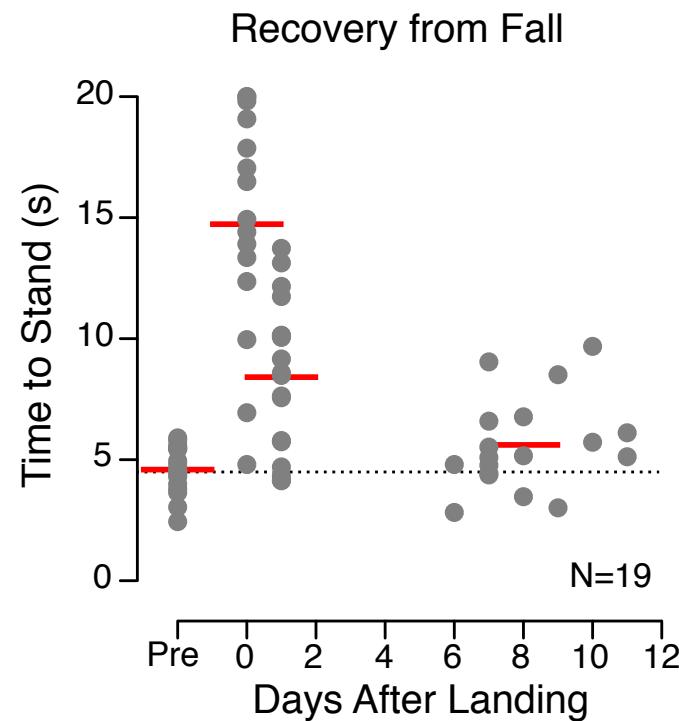
- Hormone that controls the calcium in the blood (PTH) decreased early in-flight, then increased
- Biomarkers of bone formation (IGF-1, Osteocalcin) increased in-flight

Results – Carotid Wall Thickness



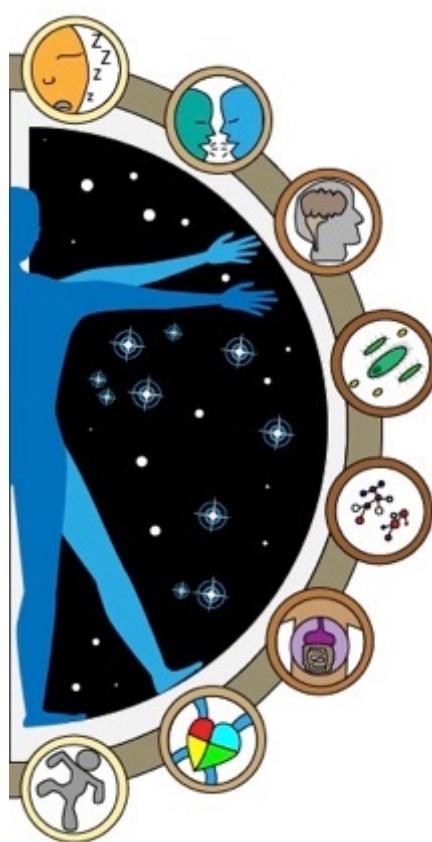
- No change in carotid intima-media thickness

Results – Sensorimotor Measures



- Standing from prone had recovered by R+8
- Tandem Walk did not fully recover at R+8

Forward Work



***Spaceflight Standard Measures* constitute a database for:**

- Providing context for data acquired by concurrent experiments
- Supporting or developing hypotheses
- Evaluating the effectiveness of various in-flight countermeasure profiles
- Comparing population responses to various mission durations (6 weeks, 6 months, 1 year)